# Nowcast for the Next Generation Navy

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## LONG-TERM GOAL

ONR provided start-up funding to develop a technical approach for the Nowcast for the Next Generation Navy system (called NOWCAST in this report). The goal is to develop a high-resolution, highly perishable weather hazard information system primarily for the Navy aircraft carrier Battlegroup to improve carrier flight operations, strike capabilities, cruise missile weaponeering, and anti-air warfare in the ship's defense. Designed to be housed in the carrier METOC facility, and in compliance with NITES architecture, NOWCAST will combine or fuse data from a variety of sources to provide the warfighter (end-user) direct access to automatic weather products. These data include three-dimensional winds in the planetary boundary layer, radar imagery from the SPY-1 weather radar obtained from the Aegis cruiser, weather from denied areas obtained from the Weather Web project of the Undersecretary of Defense for Science and Technology, MORIAH data from other ships in the Battlegroup, from-shore and direct readout satellite data, various vertical soundings of the atmosphere, and from-shore numerical weather prediction model output. Products will be web-based and warfighter-defined for easy use to avoid or exploit weather conditions that are pertinent to obtaining a full weather situational awareness of the battlespace environment.

## OBJECTIVES

During this first year, the objectives of the study were to develop a viable concept for NOWCAST, produce a vision document, and refine both the operations concept and the high-level architecture. Additionally, a series of high-level briefings were evolved and presented to many elements of the Navy, including the Commanding Officer of NRL, Oceanographer of the Navy, Naval Strike and Air Warfare Center, Commander Naval Meteorology and Oceanography Command (CNMOC), Office of Naval Research (ONR), and a variety of METOC facility, detachment, and center Commanding Officers. As a primary objective, NOWCAST was evolved to a viable concept based on the initial vision.

## APPROACH

Numerous meetings and discussions were held with the principal team members, primarily Dr. Ted Tsui and Mr. John Cook. Additionally, many discussions included the senior management and technical staff of NRL Monterey, and with elements of the nowcasting community at National Center for Atmospheric Research and MIT Lincoln Laboratory. A principal effort was devoted to the development of a high-level briefing package for both command/sponsor and technical needs. Examples from these briefings are included within this report. Based on numerous interactions stimulated by the briefings, a high-level NOWCAST architecture was developed and documented. Additionally, work analyzing the SPY-1 weather radar data was begun.

# Report Documentation Page

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## WORK COMPLETED

Three elements were completed during FY-99:

1. NOWCAST vision document.

2. NOWCAST high-level brief which represents the evolution of the operations concept to support the warfighter.

3. NOWCAST technical development, which is best represented by the high-level design document.

The following two figures best represent work completed to date:

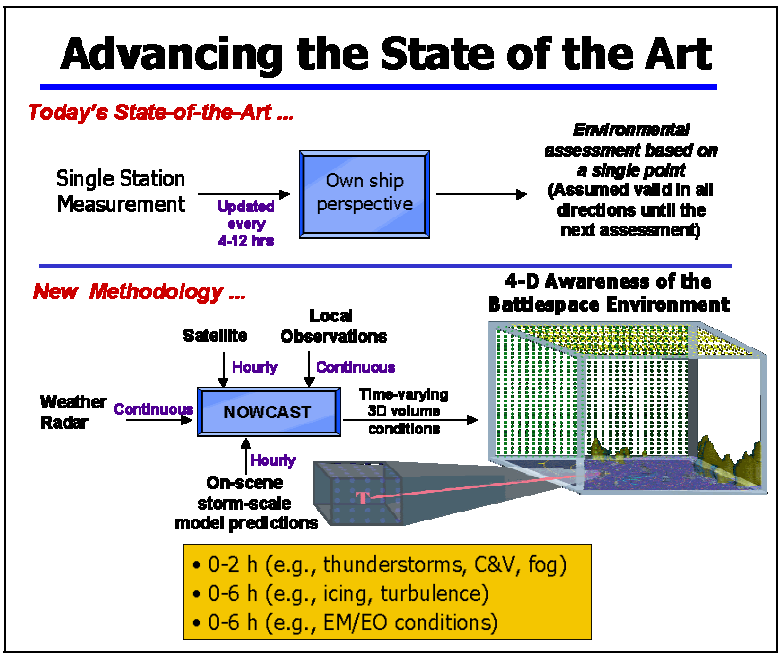


***Figure 1. This figure shows the primary concept of NOWCAST, where by the total situational awareness of the battlespace environment evolves from a single ship (top) perspective, to the whole Battlegroup within NOWCAST (bottom). Selected products are shown at the bottom. NOWCAST will be an automated system designed for the 0-6 hour timeframe, from pre-launch, launch, and recovery of sorties.***

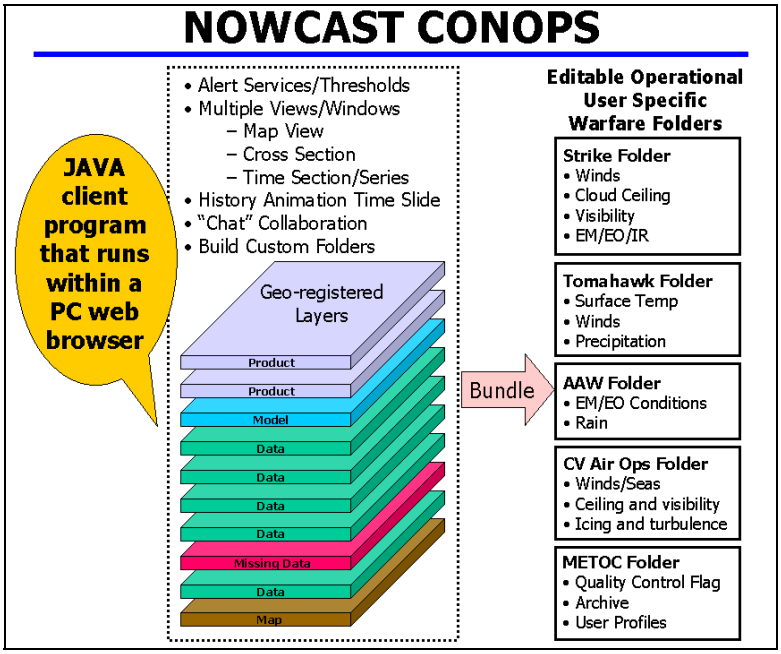


***Figure 2. This diagram represents the JAVA-based, NITES-compliant, architecture design for NOWCAST. Data, model, and product overlays are layered on top of and registered on a base map. The layers can be bundled together by the users into application specific folders. When a folder is open and product displayed within the web browser, NOWCAST will automatically update the product as new data is received. The prototype server hardware was purchased with FY-99 ONR funding.***

## RESULTS

This effort has resulted in an increasing acceptance of the NOWCAST concept by N096, ONR, CNMOC, SPAWAR, and the operational Navy as evidenced by letters of endorsement, briefings, and funding commitments. A draft Concept of Operations for NOWCAST and communication requirements were briefed to the Oceanographer of the Navy's Standing Acquisition Coordination Team (SACT) and sent to N096 and SPAWAR.

## IMPACT/APPLICATIONS

NOWCAST provides the immediate updates of the weather conditions to the METOC office as well as the warfighters. Hazardous weather alerts will be shared with the warfighters directly. All tactical mission planning and rehearsal systems will be benefited directly from the integration of output of the NOWCAST.

## TRANSITIONS

This is a new start with potential transition to a 6.4 program at the Space and Naval Warfare Systems Command (SPAWAR) PMW 185 (Navy Integrated Tactical Environmental Subsystem (NITES) Phase III). We plan for a NOWCAST prototype demonstration during FY 00 with an at-sea demonstration

during a FY 01 Fleet Battle Experiment. Plans for FY 02 include rigorous validation and verification with a potential transition during FY 03.

## RELATED ACTIVITIES

In a related area, not funded by ONR, a major Ceiling and Visibility (C&V) Nowcast project was funded by three elements: Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA), and Navy (CNMOC and SPAWAR combined $300K for each of FY 99, 00, and 01), to provide a 0-6 hour C&V nowcast to the Naval Pacific meteorology and Oceanography Center San Diego for testing, to the FAA Air Route Traffic Control Center near Los Angeles (Palmdale), and to the Aviation Weather Center at Kansas City, MO.

In addition to C&V, the principal activity that is critical to NOWCAST is the successful continuance of the SPY-1 weather radar activity. Additionally, the Weather Web project is important to provide denied area weather input to NOWCAST.

There is a related NRL base project: BE-35-2-56 (NOWCAST).

## REFERENCES

Cook, J., 1999: Top Level Design Document for the NRL Nowcast for the Next generation Navy System. [Working paper, available upon request.]

Cook, J., 1999: Estimated Battlegroup Communications Requirements for the On-Scene Tactical Atmospheric Forecast Capability (STAFC)/NOWCAST. [Working results, available upon request.]